

21st American Conference on Crystal Growth and Epitaxy

Detached Melt and Vapor Growth of InI in SUBSA Furnace

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Indium iodide (InI) is a promising wide energy band gap nuclear detector material. It is ideal for space experiments because it is non-toxic and has a relatively low melting point of only 351 C. However, it has been established that melt-grown crystals contain a large amount of second phase inclusions/precipitates. The typical size of inclusions are 1 to 27 μm in diameter, while the volume fraction of all sizes is 300 to 600 ppm. The SEM-EDS analysis of the inclusions has revealed that they all contain oxygen and some contain carbon.

At present, under sponsorship of NASA and CASIS (Center for the Advancement of Science in Space), we are conducting ground-based experiments with InI in preparation for the flight experiments to be conducted in the SUBSA (Solidification Using a Baffle in Sealed Ampoules) furnace in the Microgravity Science Glovebox at the International Space Station, planned for the summer/fall of 2017. Earth-based experiments include melt and vapor growth conducted in the SUBSA ground unit, measurements of the volumetric expansion coefficient of the melt, and measurements of the wetting angle of molten InI. Finite element modeling has been conducted to optimize the design of the flight ampoules. Alloying with Tl and Ga has given promising results.